Claims

What is claimed is:

1. An apparatus, comprising:

a coaxial line having a center conductor separated from an outer conductor by a dielectric;

a diode having an anode coupled to a first end of the center conductor and a cathode coupled to a second end of the center conductor; and

a resistance coupled in series with the diode, wherein the resistance is substantially equal to a selected matching termination resistance.

2. The apparatus of claim 1, wherein the diode is selected from the group consisting of a p-i-n diode and a tunnel diode.

3. The apparatus of claim 1, wherein an outer diameter of the diode is less than an inner diameter of the outer conductor.

4. The apparatus of claim 1, wherein the resistance is included in the diode.

5. An apparatus, comprising:

a plurality of substantially parallel transmission lines, each having a center conductor separated from a shield by a dielectric, wherein each one of the shields are coupled together, wherein a first one of the plurality of substantially parallel transmission lines has a first end coupled to an input port and a second end coupled to a thru port, and wherein a second one of the plurality of

substantially parallel transmission lines has a first end coupled to an output port and a second end coupled to an isolated port.

6. The apparatus of claim 5, wherein a third one of the plurality of substantially parallel transmission lines has a first end and a second end coupled to a return terminal.

7. The apparatus of claim 6, wherein a first selected matching resistance is coupled between the return terminal and the thru port, and wherein a second selected matching resistance substantially equal to the first selected matching resistance is coupled between the return terminal and the isolated port.

8. The apparatus of claim 7, wherein the first selected matching resistance and the second selected matching resistance are provided by impedance matched cables coupled to the thru port and to the isolated ports, respectively.

9. The apparatus of claim 6, wherein a fourth one of the plurality of substantially parallel transmission lines has a first end coupled to the input port and a second end coupled to the thru port, wherein a fifth one of the plurality of substantially parallel transmission lines has a first end coupled to the output port and a second end coupled to the isolated port, and wherein a sixth one of the plurality of substantially parallel transmission lines has a first end and a second end coupled to a return terminal.

10. The apparatus of claim 6, further comprising:

a first group of substantially parallel transmission lines having a first end coupled to the input port and a second end coupled to the thru port; and

a second group of substantially parallel transmission lines having a first end coupled to the output port and a second end coupled to the isolated port.

11. The apparatus of claim 10, wherein the third one of the plurality of substantially parallel transmission lines is substantially surrounded by the first one and the second one of the plurality of substantially parallel transmission lines, and the first group and the second group of substantially parallel transmission lines.

12. The apparatus of claim 5, wherein selected ones of the plurality of substantially parallel transmission lines include an odd multiple of one-half twists.

13. An apparatus, comprising:

a plurality of substantially parallel transmission lines, each having a center conductor surrounded by a first dielectric, wherein the first dielectric of each one of the plurality of substantially parallel transmission lines is adjacent a first shield, wherein a first one of the plurality of substantially parallel transmission lines has a first end coupled to an input port and a second end coupled to a thru port, and wherein a second one of the plurality of substantially parallel transmission lines has a first end coupled to an output port and a second end coupled to an isolated port.

14. The apparatus of claim 13, wherein the input port is located adjacent the output port, and wherein the thru port is located adjacent the isolated port.

15. The apparatus of claim 13, wherein the input port is DC coupled to the thru port, and wherein the output port is DC coupled to the isolated port.

16. The apparatus of claim 13, wherein the first shield is a substantially continuous shield surrounding the plurality of substantially parallel transmission lines, and wherein the first shield is coupled to a return terminal.

17. The apparatus of claim 13, wherein the first shield is a sparse shield surrounding the plurality of substantially parallel transmission lines.

18. The apparatus of claim 13, further comprising:

a substantially continuous second shield; and

a second dielectric substantially surrounded by the second shield, wherein the second dielectric substantially surrounds the plurality of substantially parallel transmission lines, and wherein each one of the plurality of substantially parallel transmission lines is surrounded by the first shield.

19. The apparatus of claim 18, wherein the second dielectric has a dielectric constant substantially equal to a dielectric constant of the first dielectric.

20. A system, comprising:

a charge line coupled to a first pulse source load and capable of being coupled to a power source;

a connecting line having a first end DC-coupled to a second end capable of being coupled to an output load; and

a switch to couple the charge line to the first end when in a first position, and to decouple the charge line from the first end when in a second position, wherein the connecting line has a selected impedance based on a resistance of the switch and an impedance of the charge line.

21. The system of claim 20, wherein the switch resistance comprises a switch arc resistance.

22. The system of claim 21, wherein the selected impedance is substantially equal to a sum of the resistance of the switch and an impedance of the charge line.

23. The system of claim 21, wherein a sum of the selected impedance and the resistance of the switch is less than or substantially equal to an impedance of the charge line.

24. The system of claim 20, wherein the switch comprises a single-pole double-throw switch, and wherein the switch is to couple the charge line to the power source when the switch is in the second position.

25. The system of claim 20, wherein the switch comprises a single-pole, single-throw switch, and wherein the charge line remains coupled to the power source when the switch is in either the first position or the second position.

26. The system of claim 20, wherein the first pulse source load comprises a polarized matching load.

27. The system of claim 20, further comprising:
a second pulse source load capable of being coupled to the first end of the connecting line.

28. The system of claim 27, wherein the second pulse source load comprises a polarized load.

29. The system of claim 27, wherein an impedance of the second pulse source load is substantially equal to the selected impedance.

30. The system of claim 27, wherein the impedance of the charge line is substantially equal to the resistance of the switch plus about half of the selected impedance.

31. A system, comprising:

a pulse source; and

a coupling apparatus having an input port capable of being coupled to the pulse source, a thru port capable of being coupled to a termination, and an output port capable of being coupled to an output load.

32. The system of claim 31, wherein the pulse source comprises:

a charge line coupled to a pulse source load and capable of being coupled to a voltage source; and

a switch to couple the input port to the charge line in a first position and to decouple the input port from the charge line in a second position.

33. The system of claim 32, wherein the switch comprises a single-pole single-throw switch, and wherein the charge line remains coupled to the voltage source when the switch is in either the first position or the second position.

34. The system of claim 32, wherein the switch comprises a single-pole, double-throw switch, and wherein the switch is to couple the charge line to the voltage source when the switch is in the second position.

35. The system of claim 32, wherein the coupling apparatus has an impedance substantially equal to a resistance of the switch plus an impedance of the charge line.

36. The system of claim 31, wherein the pulse source load comprises a polarized matched load.

37. The system of claim 31, wherein the pulse source load comprises a resistance in series with a capacitance.

38. The system of claim 31, wherein the coupling apparatus further comprises an isolated port.

39. The system of claim 31, wherein the thru port is coupled to the termination.

40. The system of claim 39, wherein the termination comprises an impedance matched cable coupled to the thru port.

41. A system, comprising:

a pulse source capable of being coupled to a microwave DC block coupled to a pulse source load;

a coupling apparatus having an input port, a thru port coupled to a termination, and an output port coupled to an output load; and

a switch to couple the input port to the pulse source when in a first position, and to decouple the input port from the pulse source when in a second position.

42. The system of claim 41, wherein the pulse source load comprises a resistance in series with a capacitance.

43. The system of claim 42, wherein the resistance terminates an impedance of the pulse source.

44. The system of claim 43, wherein the pulse source comprises a charge line, and wherein the impedance is substantially equal to an impedance of the charge line.

45. A method, comprising:

launching a pulse into an input port of a quarter-wave directional coupler having an impedance-matched thru port and an isolated port; and

receiving a leading edge of the pulse as a voltage spike at an output port of the coupler.

46. The method of claim 45, wherein a center frequency of the quarter-wave directional coupler is greater than about 100 MHz.

47. The method of claim 45, wherein launching the pulse into the input port of the quarter-wave directional coupler further comprises:

activating a switch to couple a pulse source to the input port.

48. The method of claim 47, further comprising:

selecting an impedance of the quarter-wave directional coupler by matching an impedance of the quarter-wave directional coupler to a sum of a resistance of the switch and an impedance of a charge line included in the pulse source.

49. The method of claim 47, further comprising:

selecting an impedance of the quarter-wave directional coupler such that a sum of the impedance of the quarter-wave directional coupler and a resistance of

the switch is less than or substantially equal to an impedance of a charge line included in the pulse source.